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March 2, 2017

SUBMITTED ELECTRONICALLY VIA ECFS

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, NW
Washington, DC 20554

Re: **Notice of *Ex Parte* Presentation**

GN Docket No. 14-177, *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*

Dear Ms. Dortch:

On February 28, John Hunter of T-Mobile, Russell Fox of Mintz Levin, and I met with the following members of the Commission's staff at a single meeting regarding the above-referenced proceeding:

Wireless Telecommunications Bureau	**Office of Engineering and Technology**
Nese Guendelsberger	Julius Knapp
Blaise Scinto	Michael Ha
Jeffrey Tignor	Bahman Badipour
Stephen Buenzow*	Barbara Pavon
Timothy Hilfiger*	Nicholas Oros
Simon Banyai	William Hurst*
Janet Young	
Matthew Pearl	
Nancy Zaczek*	

*By phone

During the meeting, we discussed the matters covered in the attached presentation. In particular, we made the following points:

- while we appreciate the Commission's leadership in making spectrum available for 5G services, there is relatively a limited amount of licensed spectrum that the Commission has made available so far in the millimeter wave bands; and the Commission should address that deficiency, including by making at least a portion of the 64-71 GHz band available for licensed use;

- the Commission should permit the use of the 37-37.6 GHz band for licensed use and not include the band segment as part of an operability requirement for the 37-40 GHz band until the rules are finalized;
- the Commission has appropriately accommodated potential satellite use of the bands dedicated for mobile terrestrial use in the *Report and Order*, and allowing further access is inappropriate and would negatively impact use of these bands for terrestrial mobile services;
- incumbent licensees should be afforded an opportunity to meet their upcoming substantial service requirement, or meet the new requirement at the end of their next license term instead of a single early requirement in 2024;
- the cybersecurity statement should be eliminated;
- the Commission should permit licensed terrestrial use of the bands specified in the *Further Notice* and in the 40-42 GHz band; and
- sharing between mobile terrestrial licensees and the Radio Astronomy Service and Earth Exploration Satellite services is feasible, to the extent required, in the additional bands targeted in the *Further Notice*.

* * * *

Pursuant to Section 1.1206(b)(2) of the Commission's rules, an electronic copy of this letter is being filed for inclusion in the above-referenced docket and a copy of this letter has been sent to members of the Commission staff with whom we met. Please direct any questions regarding this filing to the undersigned.

Respectfully submitted,

/s/ Steve Sharkey

Steve Sharkey
Vice President, Government Affairs – Technology
and Engineering Policy

Attachment

cc: (via e-mail, with attachment to all Commission staff referenced above)

FCC Meeting Millimeter Wave Bands

Feb 28 2017

Introduction

- Need to look comprehensively across bands considered in Report and Order (R&O) and the Further Notice (FNPRM)
- Alion analysis provides an overall understanding of the services in FNPRM bands and potential coexistence of 5G mobile operations with those services.
- Specific emphasis on Co-existence options with Radio Astronomy Service (RAS) and Earth Exploration Satellite Service (EESS).
- Addresses positions posed by the Boeing and other FSS providers

Reconsideration of the Millimeter-wave Report & Order

The Commission should:

- Make more spectrum available for licensed use;
- Grant incumbents the option of meeting current performance obligations at the end of their license terms and meeting new performance requirements at the same time as new entrants;
- Exclude 37-37.6 GHz from the operability requirement for the 37 and 39 GHz bands – at least until rules are in place for use of 37-37.6 GHz; and
- Limits sharing in the 37-37.6 GHz band to a two tiered Fed/Non-Fed framework (e.g., DoD with 5G UMFUS), on a licensed basis.
- Eliminate the Cybersecurity Statement requirement.

Reconsideration of the Millimeter-wave Report & Order

The Commission should reject:

- Calls to increase Fixed Satellite Service ("FSS") access to the 28, 37, and 39 GHz bands by altering the geographic limits on earth station siting or by modifying the technical parameters for Upper Microwave Flexible Use Service ("UMFUS") operations;
- Suggestions that it establish a database containing information on UMFUS station operations
  - 5G IoT devices expected to be in the *billions* – overly burdensome and unnecessary
- Requests to reconsider FSS downlink in the 42-42.5 GHz band; and
- Proposals to impose additional emissions limits on UMFUS operations in the 28 GHz band.

Millimeter-wave Bands

- **24 GHz:** Limits and coordination procedures for satellite operations in 25.05 – 25.25 GHz can be applied to 24.75 – 25.05 GHz. The sharing regime adopted for the 28 GHz band could also be applied in the 24.75 – 25.25 GHz band.

- **32 GHz (31.8-33.4 GHz):** Radio Astronomy Service (RAS) and Earth Exploration Satellite Service (EESS) operate adjacent channel at 31.3-31.8 GHz:
  - RAS - operates 16 fixed remote areas – protection through guard bands in protected areas and flexibility to coordinate will facilitate compatibility
  - EESS – Requires further discussion and analysis to determine protection

- **40 GHz (40-42 GHz):** Consistent with other DL adjacent bands (37/39 GHz), all efforts should be made to free-up the band for licensed UMFUS operations, thereby creating 5.5 contiguous gigahertz for 5G (37-42.5 GHz).

- **42 GHz (42-42.5 GHz):** Fixed and Mobile use possible while protecting RAS
  - RAS (42.5-43.5 GHz) operates at known locations, exclusion or coordination zones can provide protection where needed.
  - A detailed analysis will need to be performed to determine the size of the exclusion or coordination zones.

Radio Astronomy Service (RAS)

- **(RAS)** Operate at 16 remote locations across CONUS and its territories
- **US74** In the bands 25.55-25.67, 73-74.6, 406.1-410, 608-614, 1400-1427, 1660.5-1670, 2690-2700, and 4990- 5000 MHz, and in the bands 10.68-10.7, 15.35-15.4, 23.6-24.0, 31.3-31.5, 86-92, 100-102, 109.5-111.8, 114.25- 116, 148.5-151.5, 164-167, 200-209, and 250-252 GHz, the Radio Astronomy service shall be protected from unwanted emissions only to the extent that such radiation exceeds the level which would be present if the offending station were operating in compliance with the technical standards or criteria applicable to the service in which it operates.

Table 1:

Location	Geographical Area
Hat Creek, CA	Rectangle between latitudes 40° 00' N and 42° 00' N and between longitudes 120° 15' W and 122° 15' W
Goldstone, CA	80 kilometer radius centered on 35° 20' N, 116° 53' W
Arecibo, PR	Rectangle between latitudes 17° 30' N and 19° 00' N and between longitudes 65° 10' W and 68° 00' W
Socorro, NM	Rectangle between latitudes 32° 30' N and 35° 30' N and between longitudes 106° 00' W and 109° 00' W
Green Bank, WV	Rectangle between latitudes 37° 30' N and 39° 15' N and between longitudes 78° 30' W and 80° 30' W
Brewster, WA	80 kilometer radius centered on 48° 08' N, 119° 41' W
Fort Davis, TX	80 kilometer radius centered on 30° 38' N, 103° 57' W
Hancock, NH	80 kilometer radius centered on 42° 56' N, 71° 59' W
Kitts Peak, AZ	80 kilometer radius centered on 31° 57' N, 111° 37' W
Los Alamos, NM	80 kilometer radius centered on 35° 47' N, 106° 15' W
Mauna Kea, HI	80 kilometer radius centered on 19° 48' N, 155° 27' W
North Liberty, IA	80 kilometer radius centered on 41° 46' N, 91° 34' W
Owens Valley, CA	80 kilometer radius centered on 37° 14' N, 118° 17' W
Pie Town, NM	80 kilometer radius centered on 34° 18' N, 108° 07' W
Saint Croix, VI	80 kilometer radius centered on 17° 45' N, 64° 35' W
Big Pine, CA	Two contiguous rectangles, one between latitudes 36° 00' N and 37° 00' N and between longitudes 117° 40' W and 118° 30' W and the second between latitudes 37° 00' N and 38° 00' N and between longitudes 118° 00' W and 118° 50' W

Earth Exploration Satellite Service (EESS)

For Point-to-Multi-Point (P-MP) terminal stations (see Table 2), Recommendation ITU-R F.1245 was used to derive the antenna gain in the zenith direction. For P-MP central stations, Recommendation ITU-R F.1336 was used to derive the antenna gain in the zenith direction. The density of site of a central station operating at the same frequency is assumed to be 0.3 terminal per km^2. On the same site, two central stations may use the same frequency assuming 90 deg. sector antenna. Therefore, two terminal stations may use the same frequency within the same cell.

Table 2: Acceptable unwanted emissions level per P-MP FS system falling into the EESS band

Frequency, GHz	52.6	
Interference criteria, dB(W/100 MHz)	–166	
Altitude, km	850	
Reference bandwidth, MHz	100	
Gain EESS	45	
Free space loss	185.5	
Gaseous absorption	3	
Aggregate at the Earth, dB(W/100 MHz)	–22.5	
Aggregate at the Earth, dB(W/MHz)	– 42.5	
Station type	CS	TS
Channel spacing, MHz	28	28
FS antenna gain	14	41
FS Gain in the EESS direction	–10.3	–11.3
Aggregate power, dB(W/MHz)	–32.2	–31.2
Density of systems/km^2	0.6	0.6
Pixel size/km^2	201	201
N_b Tx	121	121
Power/Tx, dB(W/MHz)	–53	–52
Power/Tx, dB(W/100 MHz)	–33	–32

These approaches, dealing with Fixed P-P or P-MP could be used as the starting point for future collaborative efforts to deal with the mobile systems envisioned for 5G

Millimeter-wave Bands

- **47 GHz (47.2-50.2 GHz):**
  - In the 47 GHz band, exclusion or coordination zones can be implemented to protect RAS (48.94 – 49.04 GHz band).
  - Protection of adjacent passive Earth Exploration-Satellite Services (50.2 – 50.4 GHz band) requires analysis to determine the best mitigation technique. ITU reports have suggested the use of emission limits, guard bands, and filters as possible mitigation techniques (see Table 2).

  - Reject Boeing's request that the Commission "keep the entire three gigahertz of the 47 GHz band as primarily for satellite end user uplink operations.
    - The *FNPRM* proposes to authorize fixed and mobile operations in the 47 GHz band under the Part 30 rules. While Boeing claims that it is "willing to share" the 47-50.2 GHz band, it is only willing to do so if UMFUS is restricted to indoor locations. This arrangement can hardly be considered "spectrum sharing" and is directly contrary to what the Commission has proposed in the *FNPRM.*
    - Boeing's proposed use would foreclose any meaningful terrestrial mobile operations.

Millimeter-wave Bands

- **50 GHz (50.4-52.6 GHz):**
  - Similar to 47 GHz, further analysis is needed to determine the best approach to mitigating potential interference to EESS (52.6 – 52.8 GHz) in the adjacent band. Collaboration between the wireless industry and EESS operators other mitigation techniques can be determine to keep unwanted emissions out of EESS sensors (See Table 2).

  - Reject Boeing's request that the Commission authorize feeder links in the 47.2-50.2 GHz and 50.4-52.6 GHz bands subject to outcome of the rulemaking.
    - Boeing seeks use of the 50.4-52.4 GHz band – a band in which the Commission has proposed to authorize fixed and mobile terrestrial operations pursuant to its Part 30 rules. If Boeing is permitted to use the band as it proposes, ***it would therefore encumber and restrict over 5 gigahertz of spectrum (between 47 and 52 GHz) that could otherwise be used for mobile 5G terrestrial operations.***
    - Contrary to the *FNPRM*, Boeing's proposal would compromise additional spectrum that could provide much needed capacity for mobile networks. The Application cannot be granted "conditioned" on the outcome of the *FNPRM*.

Millimeter-wave Bands

- **64-71 GHz:**
  - The Commission was too quick to dismiss the possibilities for licensed mobile operations in the 64-71 GHz band, despite there being increasing evidence of this band's potential.
  - As recently filed in our comments, a Nokia study released in December 2015, as well as research conducted by NYU for instance, shows that 5G mobile services are possible in these higher frequencies, and
  - These studies show that the 64-71 GHz band has value for licensed mobile services and could lead to even greater 5G investment and innovation.

- **70/80 GHz:**
  - (10 GHz BW): Spectrum Access System (SAS) not required to protect incumbent fixed point-to-point links
  - Similarly, the Commission should not unnecessarily foreclose licensed access to these bands merely on the basis of their propagation characteristics.